# REVIEWS

*Ecology and Evolution of Plant Reproduction: New Approaches.* Edited by ROBERT WYATT. 1992. Chapman and Hall, New York. 397 p. Hardcover, $73.95. ISBN 0-412-030-217.

Plant reproductive biology has a long history, but until only a short while ago it was dominated by natural history approaches. In the early 1970's, studies on pollen movement joined ecological studies of seed production and natural history studies of pollination. But the study of plant reproduction has completely changed in character during the last 10–15 years. There seems to be an integration among population genetic, ecological and evolutioary approaches more than in other areas of biology. In the preface, Robert Wyatt describes these changes as an "intellectual revolution" and this seems a fair description, if this book represents a sampling of research in the field.

Fourteen chapters introduce us to the new directions this field is taking. Wyatt mentions in the preface that "the purpose of this book is to make some of the exciting new discoveries in this field accessible to a wide audience." This objective has been well achieved. All of the chapters represent excellent summaries of different research areas. But in addition to the usual review of new areas, most chapters also present original research. Such a combination makes this collection of articles much more interesting and unusual in contrast to the typical edited book on a research area.

Several chapters focus on pollen flow, dispersal and performance from a variety of approaches. Among these the chapter by James D. Thomson and Barbara A. Thomson on pollen presentation and viability schedules in animal-pollinated plants was particularly interesting. They started off with a good review of what's known about pollen presentation scheduling and pollen viability patterns. They followed this with a presentation of a computer model based on their field work studying *Erythronium.* The model was used to explore different patterns of pollen viability and different types of pollinator behavior. For example, they described three pollinator types, Good, Bad, and Ugly pollinators, which combined different degrees of pollen removal and redeposition. The model showed how these pollinator types varied in their effectiveness depending on the context of circumstances: timing, length of pollen viability, timing of ovule presentation, and other features. This was an excellent combination of using detailed field collected data with computer models.

Another well-written chapter was one by Maureen L Stanton, Tia-Lynn Ashman, Laura F. Galloway, and Helen J. Young on estimating male fitness of plants in natural populations. Like the Thomsons' chapter, they started out with an excellent review of issues and literature. This was followed by some additional experimental field work related to specific issues they wanted developed. A computer model was also developed to pursue some additional thoughts. I liked this chapter because they did go the extra step to bring the reader completely into the field they are investigating, and then approached it from both experimental and modeling directions in a way I found quite interesting.

Two chapters by David Lloyd and Kent Holsinger delved directly into evolutionary theory. At first both chapters seemed a little intimidating because of the mathematical approaches, but surprisingly I found both easy to follow. Similarly, both come to conclusions quite different to what I was expecting. Lloyd investigates evolutionarily stable strategies of reproduction in plants and starts off with the expression "we are in the midst of a revolution in studies of plant reproduction." He describes how the rise of evolutionary ecology has brought an emphasis on evolutionarily stable strategies (ESS's) for the deployment of pollination and dispersal mechanisms. Lloyd then

argues that selection hypotheses put forward to explain adaptive strategies must rest on a sound theoretical basis. He goes on to examine the theoretical justification for aspects of kin selection and male-female conflict. He concludes that there is no single universal answer as to whether calculations of collective or inclusive fitness give more useful descriptions of the selection of social acts in plant reproduction. Lloyd cautions that each phenomenon must be carefully examined, that kin selection formulations are not always accurate and that they have sometimes been invoked inappropriately in the past. "We cannot simply assume that kin selection is the preferred mode for describing the action of natural selection whenever we are dealing with social acts among relatives. In the future, kin selection formulations should be employed more advisedly, only when they give an accurate description of events." Holsinger explores the evolution of plant mating systems in the context of selfing in plant reproduction. He starts by making distinctions concerning inbreeding depression at the population level and at the sibling level. He then develops an alternative model, the mass-action effect model to investigate the origin and maintenance of selfing in populations. Using this model, Holsinger is able to show how plant mating systems may depend on the density of individuals and the frequency of mating types rather than on some intrinsic selective advantage. He describes his model as a hybrid between population genetic traditions that associate selfing with reproductive advantage with ecological studies that show environmental conditions may play an important role in determining when selfing evolves.

Among the other chapters, my favorite was one by Pamela K. Diggle on development and the evolution of plant reproductive characters. My interest in this chapter may result simply from how much I learned, but I think also because it is an introduction to an aspect of evolution that we all know is "important," but is not well-integrated into our thinking and experimental approaches, showing up only now and then. This chapter does an excellent job of bringing in developmental models like heterochrony, progenesis and neotony and clearly illustrating how in some circumstances they can influence floral morphology and reproductive syndromes.

All in all this is an excellent book that really does accomplish the objective of making the current research in reproductive biology accessible to a larger audience, and it does it in a generally exciting and interesting way. The book is well-edited and I found only one typo. Most chapters are well-illustrated although even more would have been helpful. Because it is a multi-author book, some chapters suffer from being combined with really well-written and clear chapters. I noticed that if I read the same chapter on different occasions, my opinion of it could increase considerably just due to the lack of contrast with the better-written chapters.

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*Flora of North America, Volume 2, Pteridophytes and Gymnosperms.* Edited by NANCY R. MORIN. Oxford University Press, New York. xvi + 475 p. Hardcover, $75. ISBN 0-19-508242-7.

Much has already been written concerning the landmark publication of the first two volumes of Flora North America (FNA). The monumental efforts of Dr. Nancy Morin, the editorial committee, and the contributing authors have deservedly met with near universal praise. Rather than repeat the accolades of other reviewers, I will discuss the taxonomic treatments of Volume 2 from my perspective as a systematist interested in plant evolutionary relationships and conservation biology.